A challenging case of broad complex tachycardia

Mokhtar Ibrahim, PhD, MRCP
Clinical fellow in cardiac electrophysiology and devices
Royal Brompton and Harefield, London
• A 32 years lady presented to A&E with palpitation, dizziness and hypotension.
• ECG showed BCT, so patient resuscitated and required DCCV.
• She was admitted to cardiology for further investigation and possible inpatient EP review for EPS or ICD.
• General and local examination were unremarkable.
• Her echocardiography revealed normal LV size with EF of 65%, no resting WMA, MVP with mild MR and normal AV, right side structures.
• She started to complain of episodes of palpitation for the last 2 years.
• These attacks are rapid, regular, of sudden onset and offset, not related to exertion and is usually associated with dizziness.
• She does not have any significant past medical history, no drug abuse.
• No FH of IHD or SCD.
• Previous ECG and Holter ECG did not show obvious abnormality.
Resting ECG
ECG during tachycardia
Basic intracardiac tracing
Tachycardia (spontaneously induced)
Tachycardia 1 min. later (Is it the same?)
Tachycardia at speed 200 mm/sec
Change from tachycardia 1 to 2
ECG of tachycardia 2
Tachycardia 3 (Is it the same?)
ECG during tachycardia 3
V pacing showing concentric VA conduction
Initiation of tachycardia 2 during retrograde V pacing
Atrial pacing showed decremental AV conduction followed by initiation of tachycardia 1
Management plan ?
Supposed mechanism of tachycardia 1
Supposed mechanism of tachycardia 2

Sinus Node

Mahaim AP

Atrioventricular Node

Left side AP

Left Bundle Branch

Right Bundle Branch
Tachycardia 3
Supposed mechanism of tachycardia 3
Management plan according to supposed mechanism of tachycardia

Tachycardia 1
- Sinus Node
- Atrioventricular Node
- Mahaim AP
- Left Bundle Branch
- Right Bundle Branch

Tachycardia 2
- Sinus Node
- Atrioventricular Node
- Mahaim AP
- Left Bundle Branch

Tachycardia 3
- Sinus Node
- Atrioventricular Node
- Mahaim AP
- Left Bundle Branch
Ablation of LT sided AP
Ablation of LT sided AP (speed 200mm/sec)
V pacing after ablation 1
Retrograde WCL
Tachycardia 2 after ablation of Lt sided AP
Two ways to ablate Mahaim AP

1. At tricuspid annulus

2. Ventricular insertion site.
Mapping at tricuspid annulus
Mapping at ventricular insertion site
Mapping at ventricular insertion site
Successful ablation site

30 msec
Atrial pacing after ablation
Mahaim fiber is a rare cause of wide complex tachycardia and it is characterized by:

1. Resting ECG has a normal or minimal preexcitation
2. ECG during tachycardia has a typical LBBB morphology with different frontal axis mostly left axis.
3. It has no retrograde conduction.
4. It has a decremental antegrade conduction.
5. Searching for the "M" (Mahaim) potential along the tricuspid annulus is the most commonly used technique for ablation >80 %, however ablation at ventricular insertion site may be also useful (1) 
6. 10-30 % of patients with Mahaim fiber have dual AV node conduction and some of them have another accessory pathway (2)

(1) McClelland et. al. circulation 1994
(2) M Josephson et. al. Arrhythm Electrophysiol Rev. 2017